Cognition and Emotion in Cinematic Virtual Reality

What are the challenges in production to creating an emotional response?

Kognition och Känsla i Filmisk Virtuell Verklighet
Vilka är utmaningarna under en produktion för att framkalla känslomässig reaktion?

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Abstract

This thesis focuses on the challenges in production to create a live-action cinematic virtual reality film that aims to trigger a certain emotional response in the viewer. Cinematic virtual reality (CVR) is the term referred to throughout this thesis that has been used by Mateer (2017) in his paper. However, the definition of CVR will differ to some extent from Mateer’s (2017) and reasons for it will be provided. Firstly, the techniques employed in the production of the cinematic virtual reality film that may elicit an emotional response and character engagement are taken from the theory of cognition and emotion in film by Smith, M. (1995) Engaging Characters: Fiction, Emotion and Cinema and David Bordwell’s Narration and the Fiction Film (1985). The theoretical framework has been applied to an analysis of a Pixar-style animated CVR film called Invasion! (2016) in order to extract guiding principles that have informed the making of my own CVR film. The importance of creating presence through immersion is highlighted as necessary in sustaining engagement and evoking emotions (Ding et al., 2018). An emotional response of entrapment, fear, insecurity and wonder is desired to be elicited by watching my CVR film. As well, emotional engagement with the character in the CVR film is aimed for to enhance the emotional response. Sound and visual cues are used that may serve to facilitate directing the viewer through the story as mentioned by Mateer (2017). Techniques identified that may create an emotional response are direct address, spatial proximity and orientation. The production of my CVR film has been informed by these techniques, however, challenges in production may have weakened the outcome such as the difficulties in monitoring the shoot resulting in problems adjusting lighting, directing the actress and avoiding object distortion on stitching lines. Furthermore, on set sound recording has been a major challenge.

My CVR film is evaluated according to these challenges and possible solutions for improvement are offered. Cinematic Virtual Reality is a medium that offers new ways for storytelling and experiences. My CVR film places the viewer in the imaginary position of a fairy thus offering a perspective of the world and connected emotions that go beyond the possible experiences in everyday life. The aim is to contribute to a deepened understanding of cinematic virtual reality filmmaking by presenting some of the techniques and production challenges of creating an emotionally compelling CVR film experience.

Keywords: Cinematic Virtual Reality (CVR), Cognition and Emotion, Presence, Immersion, Production Challenges
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1. Introduction

Cinematic Virtual Reality is an emerging medium that has not, so far, been extensively covered by researchers. Therefore, it is of great value to expand the research contributing to a more in-depth understanding of its nature, implications and consequences. In 1991, Bates already points at the importance of expanding virtual reality research that focuses on the “deep structure” of style and content instead of merely considering the interface (Bates, 1991, p. 3). He sees great potential in virtual reality addressing our imagination allowing the viewer to “go anywhere and do anything” (Bates, 1991, p. 8). However, traditional virtual reality allows greater control for the user than cinematic virtual reality in which the user can decide the direction from which to look at virtual reality. CVR is not an extension of filmmaking but a new medium with its own grammar (Mateer, 2017). Nevertheless, some techniques from filmmaking can be applied to the making of CVR films to some extent. This thesis aims to offer an exploration of cinematic virtual reality by exploring an approach that combines theory with practice. The theory is applied and tested in the making of my own CVR film. The ultimate goal is to contribute to a deeper understanding of cinematic virtual reality filmmaking techniques that could evoke the desired emotional response and create character engagement, whilst keeping the specificities of the medium in mind that offer new experiential experiences.

The desired emotional response to be elicited in the viewer by my CVR film is the feeling of entrapment, fear, insecurity and wonder which could be significantly enhanced by an emotional engagement with the character. Ideally, the viewer should keep looking at the actress and follow her movements in space by turning to her direction. When she addresses the viewer directly, the emotional engagement can be considered in two ways by mimicking her facial expressions on a minuscule level and by the viewers’ bodily reactions towards her actions, use of props and increased spatial proximity. For instance, the actress puts a glass jar over the viewer which should evoke the feeling of entrapment. By emotionally engaging with the actress, the viewer should keep looking at her and her action of taking the jar and holding it above the viewer which may trigger a bodily reaction of looking up, moving slightly backwards and crouching the body in a tense manner. The early films of Lumière and Méliès elicit an emotional engagement by the audience through focusing on the sense of spectacle and illusion of the film medium. This way of engaging with the audience through direct visual stimulation by employing close-ups or shots of actors looking at the camera is part of the cinema of attractions as outlined in Gunning’s (2006) essay. Trying to directly trigger feelings of for instance shock and focusing on arousing visual curiosity in an exhibitionistic manner is very apparent in my approach to the construction of my CVR film.

I am aware that the emotional response is also influenced by many other factors such as the viewers’ age, gender, cultural background and exposure to the medium. As well, it is crucial for the viewer to pick up the directional cues because if they are missed, story engagement and understanding will affect emotions. Thus,
every viewer should not be generalized to have the same emotional response. It would be very interesting to
do a qualitative study of the viewers’ emotional response and engagement by filming viewers standing up and
wearing the virtual reality glasses watching my CVR film. As well, a follow-up interview could be very insightful
but exceeds the scope of my thesis.

High-end head-mounted displays such as Oculus Rift and HTC Vive offer advanced head-tracking and sound
output, whilst basic consumer virtual reality glasses like Samsung Gear VR and Google Cardboard offer a
basic Virtual Reality experience that limits interactivity. A well-established cinematic virtual reality definition
is still lacking due to the infancy of the medium, however, Mateer (2017) already employs the term in his paper
and offers some valuable characteristics such as “the user’s ability to move autonomously within the virtual
world, a core attribute of traditional VR, is restricted in CVR”, nevertheless, the viewer has the ability to
choose the direction of the look creating a sense of being surrounded by the CVR world (Mateer, 2017, p. 15).
He mentions in his explanation of CVR that it “uses pre-rendered picture and sound elements exclusively”
(Mateer, 2017, p. 15) and mentions Invasion! (2016) as a CVR project, however, according to Eric Danell and
Michael Hutchinson (2016) Invasion! does render in real-time and makes use of head-tracking for more
advanced hardware viewing devices. Thus, I am considering cinematic virtual reality to intersect with
traditional virtual reality to some extent with some cinematic virtual reality films giving the opportunity for
some interactivity.

Cinematic virtual reality film can be considered as a remediation of previous immersive technologies to some
extent. It relies on established viewing habits and conventions such as picking up directorial cues to follow
the story (Mateer, 2017). Since the early 2000 the adaptation of 5.1 digital surround sound systems in cinemas
has already created a sense of having a multi-directional sense of being surrounded by the film sound space.
This enhanced sonic immersion can be contributed to the sound emerging from multiple surround sound
speakers and its 5.1 channel characteristics (Kerins, 2011). 3D films and 4D cinemas may as well add to create
a more visually and sensory immersive experience for the viewer. Film viewing in the dark cinema room is a
solitary experience to some extent which can be compared to CVR film viewing through virtual reality glasses.
However, the novelty lies in the viewer to stand up and turn around thus interacting differently with the CVR
film. Thereby, the film experience may differ in relation to where the viewer is standing and looking at the

Through immersion into the virtual film world, presence is created that may enhance the emotional response
of the viewer (Ding et al., 2018). CVR film may offer the powerful visual experience to be in the story world
having an embodied presence thus seeing the world from another perspective by putting them into the shoes
of another being that may elicit in the viewer a feeling of empathy (Shin, 2018). My CVR film strongly focuses
on these characteristics of the medium by creating a story that gives the viewer the identity of a fairy and its
perspective in 360° by being placed on the ground. The emotional response is connected to the presence of
being tiny with the consequences of an altered audio and visual perception of the world. Engagement through direct address, spatial orientation and proximity by a person in the story world are presented as ways that may enhance presence and thus the emotional response by the viewer. Furthermore, audio and visual cues are implemented into my CVR film to sustain story engagement by directing viewers’ attention (Mateer, 2017).

The making of my CVR film is strongly informed by the characteristics identified in the theoretical analysis of the animated cinematic virtual reality film called *Invasion!* (2016). The theory of cognition and emotion in film by Smith, G. M. (2003) *Film Structure and the Emotion System* and Smith, M. (1995) *Engaging Characters: Fiction, Emotion and Cinema*, provide the theoretical framework to investigate the emotional appeal of *Invasion!* (2016) which is significant because it may achieve to evoke character engagement and a desired emotional response by creating a strong immersive experience with sustained engagement and presence. In addition, it has received critical acclaim winning an Emmy Award in 2017, being in the official selection of Tribeca Film Festival in 2016 and marche du film of Festival de Cannes. The renowned director of *Invasion!* Eric Darnell has been working for DreamWorks Animation, co-directing *Madagascar* (2015) and co-founded Baobab Studios which is leading in the creation of animated cinematic virtual reality films (https://www.baobabstudios.com/about-us).

2. Theory

2.1 Presence and Immersion

Media theory with the concepts of remediation, immediacy and hypermediacy as mentioned by Bolter and Grusin (2000) in *Remediation Understanding New Media* offers a starting point in understanding virtual reality with its particular characteristics. The importance of creating presence through immersion is highlighted as a crucial feature of cinematic virtual reality film compared to traditional film (Heeter, 1992). Enhancing presence is significant because it may help to create a stronger emotional appeal (Bouchard et al., 2008). The paper *Being There: The Subjective Experience of Presence* (1992) by Carrie Heeter will be used as laying the groundwork on how a subjective experience of presence, the feeling of being in the virtual world, can be enhanced in the virtual reality environment. According to Heeter (1992), a subjective experience of presence has three dimensions namely a social, personal and environmental one. Social presence encompasses the reaction of other beings in the virtual world to the viewer. If they acknowledge the viewers´ existence in the virtual world, then he or she may feel more certain of being there. Personal presence can be created by “simulating as closely as possible the range and intensity of stimuli human senses detect and interpret in perceiving the natural world” (Heeter, 1992, p. 263). However, it does not mean that the virtual world should respond exactly like the real world in order to intensify presence. Environmental presence focuses on the responsiveness of the virtual environment. Heeter (1992) raises a very interesting question if increased responsiveness of the virtual environment could actually generate more presence. Therefore, elements from
virtual reality games could be incorporated into CVR films that may provide useful in creating high-end engaging and immersive CVR productions. However, as the focus of my practical work lies in the pre-production and production of my CVR film, generating personal and social presence has been the focus to achieve a stronger emotional appeal. It would be very interesting to dive into environmental presence in the post-production stage to reveal to what extent the blurring of boundaries between virtual reality interactive game elements and CVR could enhance an emotional response and create character engagement. CVR may benefit from the style and elements of virtual reality games. The agency given to the viewer could be seen as an opportunity for new ways of storytelling that includes the viewer with an emphasis on a first-person perspective and subjective experience. More research into that area could be of great value for developing the grammar of cinematic virtual reality.

Mateer’s (2017) emphasizes the correlation between an increased sense of presence and a greater feeling of engagement in his paper Cinematic Virtual Reality: how the traditional film director’s craft applies to immersive environments and notions of presence. He approaches cinematic virtual reality by looking at transportation theory, presence and suspension of disbelief. Mateer’s (2017) insights on directing techniques for cinematic virtual reality to maintain the viewers’ focus, immersion and engagement has been very beneficial in guiding my own filmmaking process especially in terms of cues in sustaining certain directorial control. However, the reasons to why certain techniques are more appropriate are not extensively covered by him, thus cognition and emotion is considered by him in a marginal manner. Nevertheless, from a practical point of view, he provides some valuable methods for cinematic virtual reality directing.

2.3 Cognition and Emotion

Focusing on emotions in cinematic virtual reality film viewing seems significant due to the possibility that they may evoke a stronger emotional response in the viewer (Ding et al., 2018). This hypothesis of virtual reality film having in some regards a greater emotional appeal has been tested in an experiment mentioned in the article entitled Emotional Effect of Cinematic Virtual Reality compared with traditional 2D film (2018). The findings of the experiment suggest that the emotional experience is stronger in particular to four emotions such as “excitement, nervousness, hostility and jitteriness” (Ding et al., 2018, p. 1577). The negative emotions evoked may be caused by the fear-inducing content. However, the intensity of the emotion could be related to the medium as the same film sequence from the animated Disney film The Jungle Book was presented to some viewers in 2D and for the other participants in virtual reality. Nevertheless, there might be other reasons that add to an increased emotional response such as the novelty of the medium, the first-person point of view and wearing the virtual reality glasses that may isolate the viewer from their surroundings (Ding et al., 2018). Nevertheless, the potential of cinematic virtual reality to have a certain emotional appeal can be detected and Shin (2018) offers valuable insights in his article Empathy and Embodied Virtual Experience in Virtual
Environment: To what extent can virtual reality simulate empathy and embodiment? Suggesting that some virtual reality experiences may be empathy-inducing (Shin, 2018).

For cinematic virtual reality film to evoke a certain emotional response in the viewer, the theory of cognition and emotion in film seems valuable in getting key insights into how this can be achieved. The viewer is surrounded by the virtual reality film world in 360°, however, it is crucial to be aware that the viewer has still a limited view of the film at one single time. Therefore, the viewer has the agency to frame parts of the 360° CVR world depending on head position and direction. The theory of cognition and emotion could reveal a suitable approach to understand how humans perceive and understand the world. Smith, M. (1995) Engaging Characters: Fiction, Emotion and Cinema and David Bordwell’s Narration and the Fiction Film (1985) are primarily used as the theoretical framework.

It is crucial to raise some criticism regarding cognition and emotion in film. Generalizing an emotional response in the viewer can be subject to criticism because focusing on the biological reaction that creates a certain emotional response in humans can be rather limiting. Particularly, affective mimicry can be criticized for establishing a direct link to mirroring of the facial expression and emotions felt. For instance, mirroring the smiling expression of a character does not necessarily mean that a positive emotion is induced in the viewer. Access to information unknown by the character, non-diegetic sound, voice-over-narration and the character’s inner voice may also contribute in shaping the emotional response by the viewer. Furthermore, the viewers’ emotional response can also be affected by the cultural background, gender, age, exposure to the medium and whether it the first or subsequent viewing. David Bordwell’s Narration and the Fiction Film (1985) is also limiting in some regards because CVR film may not offer the same possibilities for narration as film does for instance concerning editing. Incorporating flashbacks into CVR film can be problematic in some regards as the viewer should not feel disoriented and taken out from the sense of presence.

3. Method

3.1 Cinematic Virtual Reality Film Development

The techniques that I incorporated in my cinematic virtual reality film have been informed by my analysis of Invasion! in terms of cognition and emotion in film drawing from the theoretical framework of Smith, M. (1995) Engaging Characters: Fiction, Emotion and Cinema and David Bordwell’s Narration and the Fiction Film (1985). Firstly, Invasion! may create a strong emotional response by employing a first-person point of view using spatial orientation, proximity and direct address. The bunny comes closer and acknowledges the viewers’ presence moving the nose which could be understood as an act of smelling the viewer. Thereafter, the bunny moves around and as the threat appears, the bunny moves behind the viewer. When the viewer turns the head behind in virtual reality, the bunny is seen crouching in fear. Therefore, a sense of presence may be enhanced
by the character by developing a spatial relationship to the viewer. As Heeter (1992) notes, social presence may contribute greatly to an intensification of presence. If characters in the virtual story world address the viewer directly believing in their existence, then the viewer may feel more immersed and present with an embodied self. Therefore, I have decided to direct the actress to step over the 360° camera, looking directly at and interacting with it as if it was a real being.

Moreover, the actress was directed to come as close as possible to the camera, laying on the ground making the facial expression and particularly eyes become very visible in order to communicate her emotions and establish a bond with the viewer. This approach is inspired by an analysis of Invasion! (2016) that reveals some elements of the structures of sympathy by Smith (1995) focusing on character recognition, alignment and allegiance to form empathetic character attachment. The importance of the big eyes looking directly at the viewer is paid attention to in particular. The character coming closer to the viewer, creates a sense of closeness and intimacy that can be compared to some extend to the close-up of traditional 2D film. This emotional contagion can be explored in greater depth in relation to the automatic process of affective mimicry as pointed out by Smith (1995). The emphasis on the face is chosen because it may activate the viewers’ emotional response through a subconscious mirroring of the facial expression which is on a miniscule muscular level but may still affect the emotional state of the viewer (Smith, 1995). However, it is crucial to note that Invasion! viewed on high-end devices with head-tracking allows for greater interactivity and thus possibly engagement and emotions. As Darnell and Hutchinson note (2016), responsiveness to the viewer is achieved by letting the bunny mimic the pose of the viewer for instance if the user moves his head to the side the bunny might mirror it which may strengthened the emotional bond and increase empathy (Darnell and Hutchinson, 2016).

The film Invasion! (2016) has a clear three-act story structure that could be followed and understood by the viewer to create an emotional appeal. This narrative comprehension can be analysed by taking the constructivist approach of cognition by David Bordwell in Narration and the Fiction Film (1985) that points at schematas of top-down and bottom-up processes. Top-down processes organize the knowledge whilst bottom-up processes are triggering an involuntary and fast response. The active process of viewing with the focus on understanding cues by making inferences and hypothesis testing can be detected whilst viewing Invasion! (2016). This has been employed in my CVR film by taking the perceptive of the viewer during its development thinking about what hypothesis may the viewer make whilst viewing certain reactions of the actress Tina. What information need to be provided and how long can the viewer be left guessing about their identity as a fairy? This has been very crucial in constructing the pacing of my cinematic virtual reality film. An example of taking this approach can be found in the beginning part of my CVR film when Tina reaches out for the scarf on the ground and jumps on the couch in fear saying that she hates spiders. This reaction may trigger the hypothesis in the viewer that they are a spider and furthermore by her pulling a glass over the viewer (camera) they may fear that her hostile behaviour may put them into danger. By hearing the vacuum cleaner approaching and its noise intensifying as the glass is lifted and the vacuum cleaner being close to the
camera, the viewer may have an involuntary physiological bottom-up process of surprise or fear that is triggered by the fast and loud noise.

The importance of audio, direction of the look and light to emphasise the point of interest are some of the cues that Invasion! (2016) may successfully employ to direct the viewer’s attention in 360° to achieve narrative engagement and elicit an emotional response. However, it needs to be noted that guiding the viewers’ look through the story could be more easily achieved by Invasion! with head-tracking devices as the rendering in real-time offers a direct adjustment to the viewers’ look by keeping the eye contact between the character and viewer regardless of his or her position and by pausing the narrative (Darnell and Hutchinson, 2016). This has been strongly compromised in my CVR film as it is pre-rendered and does not offer that possibility for responsiveness and feedback which may diminish engagement and evoked emotions. Nevertheless, I was inspired to employ certain techniques for directing the viewers’ attention for instance by using sound. In the beginning of my CVR film, the sound of a mobile phone alarm can be heard in order to inspire the user to find the sound source. In addition, the look and actions of the actress such as moving to the side when she looks for the box may direct the viewer to follow her direction like in Invasion! when the bunny becomes the point of interest and the actions of the bunny may direct the viewers´ attention. To furthermore emphasize her as a point of interest, I tried to use light in a way to put the focus on her face by being lit up whilst the background becomes dark and unimportant.

The notion of play can also provide a very interesting understanding of how viewers may engage with a cinematic virtual reality film. Joseph D. Anderson (1989) in his book The Reality of Illusion: An Ecological Approach to Cognitive Film Theory lays out the importance of play and how cinema is a form that arouses and stimulates through imaginative play. Invasion! can be considered to work on these grounds, as dialogue is non-existent in the film. The only instance of hearing someone speak is the voice-over-narration in the beginning, therefore the film relies to a great extent on the visual perception and how the characters visually create a sense of wonder, play, understanding and engagement. Thus, I used this insight by directing the actress in my CVR film in a way that prioritizes her actions, facial expressions and gestures instead of her verbal expressions to sustain wonder and engagement.

Offering a medium-specific experience has guided me in the pre-production process to a great extent. I was aiming to create a compelling visual experience that only the medium of virtual reality could offer. Films such as Honey, I shrunk the kids (1987) and Honey, I blew up the kid (1992) served as an inspiration due to the visually and aurally compelling change in perspective. The use of props such as magnifying glasses and the creation of fear from objects close to the ground and the increase in volume of diegetic sounds have informed by process. In addition, the book Nils Karlson Pyssling (1982) by Astrid Lindgren has provided me with a creative and imaginative mind-set to construct my story. Inspiration has also been taken from my childhood memories of being strongly fascinated by fairies. Putting the viewers in the shoes of a fairy thus seeing the world in 360°
from the perspective of being tiny on the ground, seemed to be a new experience. Watching the film in 360° does not create a strong sense of presence and perspective. Therefore, I realized that this experience is specifically meant to be viewed with virtual reality glasses in order to achieve the desired effect.

In regard to the story development, the creation of a sense of presence, feeling of entrapment, uncertainty and fear in the viewer has guided the process that is strongly connected to the altered perspective. The feeling of presence has been tried to be intensified through her moving above the viewer and her feet being close to the camera thus getting an immediate feeling of the change in perspective. Direct visual stimulation has been informed by the cinema of attraction with a sense of spectacle and immediate response (Gunning, 2006). This can be seen for instance in the choice to let the actress throw a scarf in the direction of the camera. As she picks up the scarf she looks at the camera and jumps on the coach taking a glass jar which she puts over the camera. The jar has been used to evoke the sense of entrapment and being able to see the glass all around may add to the emotional response. Another visual cue to entrapment is the candle box that she holds in front of the viewer saying that this is where she will keep them and they are locked safely.

4. Analysis and Discussion: Production Challenges

4.1 Recording Technology

The technological limitations had a great impact on the making of my cinematic virtual reality film. Through a trial and error approach, I realized what worked in virtual reality and what did not work out as well as compared to 2D film. However, I acquired some basic knowledge about cinematic virtual reality production by completing the course VR and 360 Production on the online learning platform coursera (https://www.coursera.org/learn/360-vr-video-production). I gained the awareness of the necessity of a meticulous pre-production with overhead-diagrams and detailed notes as the CVR film is shot in one long take thus making adjustments during the shooting and in the post-production stage is limited.

Through an organic process of story creation working with improvisation, I devised the separate elements of the scene. After recording one part of the scene, I transferred the data to my phone and watched it through the google cardboard. I used the virtual reality camera Ricoh Theta for this process because my phone was compatible with the App that works with this virtual reality camera. However, the recording quality is inferior to the Samsung Gear 360 thus I decided to use the virtual reality camera by Samsung for the final shooting. This pre-production process has been time-consuming but necessary to get a better sense of how to direct the actress before the shoot keeping the perspective of virtual reality filmmaking in mind. I realized that even with the Samsung Gear 360, the resolution is rather low meaning that details in the background are not clearly visible. If the actress is further away from the camera some of her facial expressions may not be visible enough.
Therefore, it encouraged me even more to focus on directing the actress to be closer to the camera and putting emphasis on her facial expressions and gestures.

The process could have been significantly accelerated by using the virtual reality glasses Samsung Gear VR and an advanced Samsung phone with 4K resolution which is capable of installing the App Samsung Gear 360 Power Director that directly transfers the shoots from the 360° camera Samsung Gear 360. Having access to all the devices could have helped me significantly in monitoring the shoot and giving direct feedback to the actress after each shot. However, I am not certain if it works seamlessly because of certain technical problems I have encountered. Firstly, as my phone is not technically advanced enough, it could not download the necessary App, thus, I asked Tina to use her phone for the shoot. She was successful in downloading the App, however, it was not possible to connect the camera to her phone. The App was not able to establish a connection via wifi nor Bluetooth. Even though the connection could have been established, it is highly questionable if it would be possible to watch it simultaneously on the Samsung Gear VR whilst recording due to the high amount of data being transferred without a stable cable connection. For it to function seamlessly, the phone may need to be close to the camera which is a challenge in cinematic virtual reality production as the director cannot be in the shot thus needs to be out of sight. I had to be in another room, thus I was unable to see her perform live which made it extremely difficult to give her feedback on her acting. Nevertheless, I tried to give her some feedback in regard to what I heard and the pacing of the story. Not being able to be on set or see her performance through a playback device has been a major challenge that affected my directorial control to see if certain actions of her where included in her acting that could enhance the emotional response such as moving closer and engaging through making a hand gesture signalling to the viewer to come closer. Therefore, I had to rely to a large extent on the pre-production process and the preparation talk in which I laid out in detail how Tina should move, use props and interact with the camera.

After the first shooting, I transferred the data from the Samsung Gear 360 to the computer which did take significantly more time than the data transfer from traditional 2D shots. When I was able to see the recording, I realized that the camera has not recorded the full length of the shot but has switched off before the end. Having had access to a playback device in that moment of the shoot would have allowed me to be certain that the camera did record the full duration of the desired shot. As the recording was cut off, I decided to re-shoot the CVR film. As well, the pacing of the film was not ideal as a duration of 10 minutes seemed to stretch the story and weaken the engagement. Thus, I readjusted the story arc and introduced other elements such as the candle box to reinforce the feeling of entrapment. Being aware of recording a long take has shifted the focus significantly to the story development and its pacing. However, it is difficult to predict how much time viewers exactly need to get at ease with the environment and if they would follow the cues.

Due to Tina being close to the camera and holding objects in front of one lens of the camera and to the sides, object distortion on stitching lines occurred most obviously noticeable in the tiny dress when she places it to the side. This could not have been seen before due to the inability to monitor the shoot as mentioned above.
Tina has acting experience in theatre and for film but this was her first cinematic virtual reality film thus she was not knowing intuitively how close she could come to the camera or where to position objects. In addition, the lighting may have enhanced object distortion. The problem in distortion may play a major role in decreasing the emotional response in the viewer due to the weakened feeling of subjective presence. The feeling of the viewer to believe in the virtual world and to feel part of it may suffer significantly from the distortion. The artificiality of the virtual world is revealed which may break with the illusion contributing to a decrease in presence leading to a lower engagement and emotional response. In retrospective, much more attention should have been played to the technical issues of recording and distortion on stitching lines may have been avoided by doing more test shoots with the actress considering exactly her position and the lighting condition. It may have been as well very beneficial if she would have seen the first trial shoot in full length with the virtual reality glasses on so that she may get a feeling for the medium and knows how to position herself in relation to the camera to avoid technical issues.

4.2 Lighting

Lighting cannot be used in the same manner as in the shooting of a 2D film in which everything behind the camera is out of sight. Shooting in 360° triggered me to use existing lighting in the scene in innovative ways to enhance the focus on Tina’s face by lighting it up whereas the background becomes dark. The light emphasizes her as the point of interest and helps the direct engagement with the viewer creating a closer atmosphere and isolating him or her from the rest of the world. Problems that occurred are that the camera casts a shadow thus the viewer may realize that they are not a fairy. This could be fixed in post-production by removing the shadow and the reflection of the camera on the glass. I have attempted to address these issues in the post-production process and although Adobe Premiere Pro has released new VR editing tools for their programmes in 2018, it did not work seamlessly. Adobe Premiere Pro After Effects had problems with rendering the fixed sequence shutting down several times. Lighting is important as it creates a focus of attention, creating a certain atmosphere and thereby evoking an emotional response, but the effect of light on the lenses creating circular reflections has been underestimated. The artificiality of the medium is again revealed which may affect presence and thus emotions.

4.3 Audio Recording

Sound plays a very crucial role in giving the visual experience a stronger emotional appeal. In the pre-production stage I devised a list of diegetic sounds that I wanted to have in the film to create presence and the feelings mentioned above. I aimed to incorporate footsteps, the sound of the jar being put over the camera, tapping of her fingers on the jar and the noise of the vacuum cleaner. However, for presence to be enhanced the sound should be audible from the direction that matches with the source. However, spatial sound design
for virtual reality has created a major challenge. Special sound recording devices are needed such as the newly released H3-VR by zoom that records stereo binaural 3D. Unfortunately, I did not have access to this virtual reality sound equipment. Nevertheless, the Samsung Gear 360 camera that I have used could record sound although in a much lower quality. Being directed by the sound to change the direction of looking may not work as well as envisioned. Looking at the gaming industry, ways to creating artificial spatial sound design in post-production may be possible by exporting the project to the unreal engine and using the resonance VR plugin by google. However, this is a complicated process which may exceed the timeframe of the project. I am aware that the loss in spatial audio may be one significant factor in decreasing the sense of presence. However, as Bouchard et al. (2008) notes, anxiety may help the viewer to feel presence drawing attention away from the artificiality of the medium. The diegetic sounds should increase the sense of fear as they may have a cognitively faster impact on the emotional response, especially the sound of the vacuum cleaner coming closer to the viewer.

5. Conclusion

The challenges in production to produce my own cinematic virtual reality film evoking an emotional response has been significant. The major problem has been the technology of recording with the inability to monitor the shooting. Therefore, giving feedback on the acting and adjusting the scene has been problematic. Furthermore, in order for an emotional response of entrapment, fear and character engagement to develop, presence should be enhanced and sustained. Although, great effort has been placed during the pre-production stage of story development and guiding techniques, the quality of the images with the distortion on stitching lines, shadows and reflections may break with the illusion and may weaken presence. Moreover, sound recording has been a challenge as sound could not be recorded in a binaural manner on set. Sound cues directing the viewers’ look in the virtual world environment may not work for my CVR film which may substantially weaken presence, engagement and emotions. Advancements in CVR production technology need to be made that allows for a faster, more reliable and intuitive workflow with high-quality image output maintaining sound fidelity.

6. References

Journal Article:


Festival Paper


Books:


Virtual Reality Films


Films:


## Appendix

### Pre-Production Material

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<th>Elements / Props</th>
<th>Description</th>
<th>Does it work/ Yes or no and why/improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoes</td>
<td>The actress gets into the shoes. Stepping over the camera creating proximity and moving around.</td>
<td>Works if shoes are close to the camera (5-10cm) and the actress steps above the camera slowly. Too fast movements may disorient the viewer and create dizziness.</td>
</tr>
<tr>
<td>Hairbrush</td>
<td>In order to notice the camera, the actress needs to look down, so by letting the hairbrush fall, she will bend down and spot the camera.</td>
<td>Does not work because the hairbrush falls too fast, not dramatic enough.</td>
</tr>
<tr>
<td>Scarf</td>
<td>Instead of a hairbrush, a scarf is used to by the actress which is accidently thrown in the direction of the viewer reminiscent of the cinema of attractions.</td>
<td>It works because if falls slower and at the camera. A feeling of the object’s closeness is evoked.</td>
</tr>
<tr>
<td>Glass Jar</td>
<td>The actress reaches for a glass jar and pulls it over the camera.</td>
<td>It works creating a feeling of entrapment but the actress should perform the action slowly.</td>
</tr>
<tr>
<td>Vacuum Cleaner</td>
<td>The actress takes the vacuum cleaner and moves it in the direction of the camera.</td>
<td>It works but not dramatic enough. Suggested to lift up the jar slightly making the vacuum noise be loudly audible triggering a fast emotional reaction.</td>
</tr>
<tr>
<td>Desk lamp</td>
<td>The actress takes a desk lamp and places it near the camera so that the light shines directly above it.</td>
<td>It works to create a more intimate feel making the background become darker. However, camera casts a shadow.</td>
</tr>
<tr>
<td>Desk lamp at the desk</td>
<td>Help to have more natural lighting to improve image quality for details.</td>
<td>Light may disturb the viewer looking at the direction of the desk. Details are still not very well visible in the background.</td>
</tr>
<tr>
<td>Actions: Tapping</td>
<td>The actress should tap the glass and hold it with her hands.</td>
<td>Noise of tapping may work to create a sense of being in a glass jar.</td>
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<tr>
<td>Magnifying Glass</td>
<td>The actress should take the magnifying glass and look through it at the camera.</td>
<td>It worked but a bigger magnifying glass could be good. Eyes are seen widely works very well playing with the perception of big and small.</td>
</tr>
<tr>
<td>Actions discovering fairy</td>
<td>Once the actress realizes that the “camera” is not a spider but a fairy, she should interact by pointing down at the shoes, hugging the camera and asking with a hand gesture to come closer.</td>
<td>Works to create a sense of embodied presence. Works better if she bends/lies down and interacts more closely.</td>
</tr>
<tr>
<td>Picking up the fairy</td>
<td>The actress takes the fairy in her hands and shows her the room.</td>
<td>Does not work at all in VR. Not even slow movements as one feels dizzy through motion sickness. Thus, camera needs to remain fixed.</td>
</tr>
<tr>
<td>Childhood memories</td>
<td>The actress talks about her childhood memories connected to fairies to allow for bonding.</td>
<td>It works if the actress keeps eye contact with the camera. The pacing is a major question as there is no possibility for an interaction in the form of a dialogue. How long can the audience listen after the beginning emotional threats? Will it take out the emotions?</td>
</tr>
<tr>
<td>Fairy Box: Bed, Dress and Candy</td>
<td>The actress takes the fairy box and holds the bed in front of the viewer, then the dress and candy.</td>
<td>It could work to create engagement playing with identity and perspective. Especially the dress needs to be held right in front of the camera giving a feeling of wearing the dress.</td>
</tr>
<tr>
<td>Fairy Box: Drawing of Fairyland</td>
<td>The actress spots a drawing of fairyland in the fairy box and thus says that the fairy must come from somewhere.</td>
<td>The drawing can serve as a strong visual cue but needs to be opened up as close as possible to the camera otherwise it appears pixelated. Her thoughts need to be communicated.</td>
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<tr>
<td>Candle Box</td>
<td>The actress turns around and takes the candle box, opens and locks it saying that it is the place where the fairy can stay safely.</td>
<td>The feeling of entrapment could be conveyed very well by the use of the candle box. A change in her behavior of being possessive and wanting to keep the fairy can enhance the fear.</td>
</tr>
<tr>
<td>Fairy Door</td>
<td>As the actress realizes that the fairy must come from somewhere she says that there must be a fairy door.</td>
<td>The fairy door needs to be as close to the camera as possible otherwise it cannot be seen well. Ideally, it should be placed eye level to the camera. The actress should point at it or search for it slower, or there should be a noise of her finding it otherwise the viewer will not follow the end.</td>
</tr>
<tr>
<td>Lighter</td>
<td>The actress takes the lighter to burn down the fairy door so that the fairy cannot go back. Should be the climactic moment.</td>
<td>The flame is not dramatic enough. In post-production, the fire can be added and/or the noise of burning cardboard.</td>
</tr>
</tbody>
</table>

*Table 1. Crafting elements of the CVR film by shooting them with the Rico Theta and testing how it looks wearing the google cardboard glasses*
Overhead Diagrams

1) Character descending bunk bed  
2) Throwing scarf & picking it up  
3) Tacking glass jar & vacuum cleaner getting into shoes

4) Vacuum cleaner close to camera  
5) Take lamp & magnifying glass  
6) Lift glass jar & get fairy box

7) Show bed, dress, candy, drawing  
8) Bring candle box  
9) Get lighter & hold the flame close

Course on VR and 360 Production

Accessed online on 1st of November 2018 via https://www.coursera.org/learn/360-vr-video-production

Devices Used:

- Ricoh Theta (rehearsal recordings), stitching software: Ricoh Theta App
- Samsung Gear 360 (on set shooting), stitching software: Power Director, micro SD Card 16GB
- Post-Production: Adobe Premiere Pro and Adobe Premiere Pro After Effects

Needed:
➢ Sound Recording: Zoom H3-VR
➢ Fast SD card with sufficient storage capacity e.g. SanDisk Extreme microSDHC 32GB with speed up to 100MB/s 667X
➢ Samsung Gear VR and compatible phone with a high resolution and fast processing speed
➢ Unreal Engine with resonance VR plugin by google

Books
